being limited, preference is given in the purchase of foreign works to the departments of history, letters, and the arts, these being the subjects in which the librarians themselves have special interest and knowledge. Important scientific books are thus often overlooked. The current books of reference and the principal foreign journals are difficult of access, and are not at hand for immediate use; journals are often not available for a year, or more, after the date of issue owing to their being sent to the binders. For these reasons, and on account of the time wasted in waiting and formalities, the principal libraries are hardly used at all for scientific purposes by most of the workers engaged in active research. The professors and teachers of Paris consider that the special libraries attached to the actual laboratories are more valued and are of greater use than the larger and more general libraries, and that these should be coordinated so as to be available for any properly accredited worker. On the other hand, there seems to be a desire on the part of the Government to limit the usefulness of these actual working libraries by reducing the grants formerly allotted to them. Some of the criticisms of the Paris libraries and suggestions for their amelioration are not without application in this country.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 15.—"Contributions to the Physiology of Mammalian Reproduction. Part i., The Œstrous Cycle in the Dog. Part ii., The Ovary as an Organ of Internal Secretion." By F. H. A. **Marshall** and W. A. **Jolly**. Communicated by Prof. E. A. Schäfer, F.R.S.

The experiments lead to the conclusion that the ovary is an organ providing an internal secretion which is elaborated by the follicular epithelial cells or by the interstitial cells of the stroma. This secretion circulating in the blood induces menstruation and heat. After ovulation, which takes place during œstrus, the corpus luteum is formed, and this organ provides a further secretion the function of which is essential for the changes taking place during the attachment and development of the embryo in the first stages of pregnancy.

June 8.—"Researches on Explosives." Part iii. By Sir Andrew **Noble**, Bart., K.C.B., F.R.S.

The principal object of the researches which are communicated in this paper was to ascertain, with as much accuracy as possible, the differences in the transformations which modern explosives suffer when fired under gradually increasing pressures. The first part of the paper gives a description of the varied apparatus employed.

Although the author has made experiments with many other explosives, those examined in this paper are three in number:—(1) Cordite; (2) the cordite known as M.D.; and (3) a tubular nitro-cellulose.

The modes of observation and calculation followed are described, and then in tabular form are given the results of the series of experiments on the three explosives named. These tables being too extensive to reproduce in full, the results of the experiments at the lowest and highest densities alone are given:—

	Cordite Mark I.		M.D. Cordite		Nitro-Cellulose	
Density of charge exploded.	0·05	0·50	0·05	0·45	0·05	0·45
Volumes of permanent gas per gram.	678·0	623·6	781·8	676·3	814·7	680·9
Volume of total gas per gram.	877·8	798·8	955·4	810·6	993·1	816·3
Percentage volumes of permanent gases.						
CO_2 ...	27·15	41·95	18·15	36·60	17·90	35·00
CO ...	34·35	19·10	42·60	24·80	43·45	27·85
H ...	17·50	12·05	23·15	11·90	24·40	12·65
CH_4 ...	0·30	7·05	0·35	10·70	0·60	11·10
N ...	20·70	19·85	15·75	16·00	13·65	13·40
Percentage volumes of total gases.						
CO_2 ...	20·97	33·02	14·85	30·56	14·68	29·16
CO ...	26·53	15·03	34·87	20·71	35·63	23·20
H ..	13·52	9·48	18·95	9·94	20·01	10·54
CH_4 ...	0·23	5·55	0·29	8·94	0·49	9·25
N ...	15·99	15·62	12·89	13·36	11·19	11·16
H_2O ...	22·76	21·30	18·15	16·49	18·00	16·69
Percentage weights of total gases.						
CO_2 ...	36·10	51·84	27·69	48·75	28·19	47·26
CO ...	29·00	15·03	41·38	21·02	43·53	23·92
H ...	1·14	0·67	1·62	0·72	1·74	0·79
CH_4 ...	0·18	3·18	0·18	5·19	0·34	5·45
N ...	17·63	15·65	15·32	13·59	13·71	11·54
H_2O ...	15·95	13·63	13·81	10·73	12·49	11·04
Pressure in tons per square inch.	2·9	52·9	2·7	43·22	3·35	40·5
Pressure in atmospheres.	442·1	8063·8	411·6	6587·3	510·7	6173·6
Units of heat, water fluid.	1272·3	1360·0	1035·9	1190·0	896·1	1036·9
Units of heat, water gaseous.	1186·8	1287·0	961·9	1132·5	829·2	977·7
Specific heat.	0·23040	0·22385	0·23714	0·22529	0·23772	0·22828
Temperatures of explosion, Centigrade.	5151°·1	5749°·4	4056°·2	5026°·8	3488°·1	4282°·9
Comparative potential energy.	0·9825	1·0000	0·8401	0·8842	0·7389	0·7686

If the figures given in these tables be carefully examined, it will be observed that for the three explosives the transformation on firing appears, in all, to follow the same general laws.

Thus in all three there is, with increase of pressure, at first a slight increase, afterwards a steady decrease, in the volume of permanent gases produced.

In all three explosives there is, with increased pressure, a large increase in the volume of carbonic anhydride, and a large decrease in the volume of carbonic monoxide. In the volume of hydrogen this decrease with increase of pressure is very great; while methane, the percentage of which with low pressures is quite insignificant, very rapidly increases, and at the highest density is from twenty to thirty times greater than at the lowest density.

There are some variations in the percentages of nitrogen and water vapour, but on the whole these constituents may be considered to be nearly constant.

The units of heat developed show with increased pressure a slight decline at first, but afterwards increase somewhat rapidly at the higher pressures.

In the tables submitted it will be observed that the specific heats and the temperatures of explosion have been given, but with respect to temperatures so far above those in regard to which accurate observations have been made the figures given can only be taken as provisional.

These temperatures have been obtained by dividing the units of heat (water gaseous) by the specific heats; although provisional, they can safely be used in comparing the temperatures of explosion of the three explosives.

The comparative approximate potential energies are obtained by multiplying the volume of gas produced by the temperature of explosion. The means for the three explosives are respectively:—cordite, 0·9762; M.D., 0·8387; nitro-cellulose, 0·7464. The highest potential energy (taken as unity), it will be noted, was obtained from cordite at a density of 0·5.

It is submitted that the wide differences in the transformation of the three explosives with which the experiments have been made justify the general conclusion at which Sir F. Abel and the writer arrived in the year 1874 (*Transactions of the Royal Society*, vol. clxiii. p. 85) with respect to gunpowder, viz. that any attempt to define by a chemical equation the nature of the metamorphosis which an explosive may be considered to undergo would only be calculated to convey an erroneous impression regarding the *definite nature* of the chemical results and *their uniformity* under different conditions.

The paper continues with a description of the experiments made to determine the time required for the complete ignition of certain explosives, and also of other experiments to determine the rate at which the exploded gases part with their heat to the walls of the vessels in which they are confined; and in conclusion it is pointed out that the experiments made on erosion, with the three explosives referred to in this paper, and with some other explosives, have satisfied the author that the amount of absolute erosion is governed practically entirely by the heat developed by the explosion.

"Colours in Metal Glasses, in Metallic Films, and in Metallic Solutions." II. By J. C. Maxwell **Garnett.**

Expressions, giving the refractive index and the absorption coefficient (the optical constants) of a compound medium consisting of metal (1) in small spheres (granular), and (2) in discrete molecules (amorphous), diffused through an isotropic non-dispersive transparent medium (the solvent), in terms of the corresponding optical constants of the normal metal, were first obtained. The particular formulæ, which apply when the volume proportion (μ) of metal in the compound medium is small, followed immediately. By means of these formulæ and of the numerical values of the optical constants of gold, silver, and copper for monochromatic light of several different wavelengths, the values of the corresponding optical constants of diffusions of spheres and of molecules of these metals, in glass, in water, and *in vacuo*, were calculated and tabulated. The absorptions of monochromatic light by specimens of gold and copper ruby glass and of silver-stained glass were measured. A comparison of the measured absorptions of gold ruby glass with the calculated absorptions of gold spheres and of gold molecules diffused in glass, and a collation of the results with others previously published,[1] show that the colour of gold ruby glass is primarily due to the presence of spheres (not molecules) of the metal. The presence of crystallites, formed by the coagulation of the gold spheres, and reflecting red light, accounts for the irregular blue and purple colours sometimes transmitted by gold glass. Further, when the absorptions of a colloidal solution of gold in water are compared with the calculated absorptions of gold spheres and molecules diffused in water, it appears that colloidal gold consists of small spheres in suspension.

The close similarity between the observed absorptions of glass stained (amber) with silver, and the calculated absorptions of silver spheres in glass—those of a diffusion of silver molecules in glass are quite different—indicates that the stained region must contain small spheres of silver. The presence of silver spheres (but not of discrete molecules of silver) also accounts for the brilliant blue reflection from the interface between the stained and unstained regions of Stokes's specimens of silver glass. Ehrenhaft's[2] description of the nature and position of the absorption band observed in the spectrum of colloidal solutions of silver describes so well the position of the absorption band determined by calculation for a diffusion of silver spheres (but not of silver molecules) in water as to justify the conclusion that the bulk of the silver present in colloidal solution is in the form of small spheres, little, if any, being in true solution (*i.e.* molecularly subdivided); and this conclusion is confirmed by the fact that the refractive index of a colloidal solution of silver, which was measured by Barus and Schneider, is precisely that which calculation gives as the refractive index of a diffusion of silver spheres (but not of molecules) in water.

A comparison of the observed and calculated absorptions shows that copper ruby glass owes its colour to the presence in the glass of small spheres of metallic copper; but some copper molecules are probably also present.

Calculation proves that diffused spheres of cobalt would give a reddish colour to glass. Cobalt glass is not coloured by the metal in the metallic form.

The colours produced in gold, silver, and soda glasses by the radiation from the emanation from radium suggest that these glasses contain free ions of the metal, and that it is by the discharge of these ions and the consequent reduction of the metal that kathode and Becquerel rays are able to colour the glasses.

Curves were constructed to show how the calculated absorptions and reflections of red, yellow, green, and blue light by gold and silver films vary with the volume proportion, μ, of metal in the film; and a comparison of these calculated colour changes with those exhibited by the gold and silver films, which Faraday and Beilby had prepared, when subjected to heat and to pressure, indicated that (*a*) the films as first prepared were in the amorphous or granular phase; (*b*) heating diminished the density of the film, while pressure was able to increase that density again; and finally (*c*) this diminution of density was probably effected by the passage of the metal from the amorphous to the granular phase, and by the growth of the larger granules at the expense of the smaller, while increase of density was accomplished by changing some of the metal from the granular to the amorphous phase.

Optical and other evidence led to the conclusion that Carey Lea's silver was not allotropic, but consisted of normal silver in a finely divided (but not necessarily granular) state. It appeared, therefore, probable that many forms of metals, which have hitherto been supposed to be allotropic because they possessed optical properties distinct from those belonging to the metals in their normal states, were merely cases of fine division. Thus the properties of Bolley's lead, of Schützenberger's silver, and of other alleged cases of allotropy cited by Roberts-Austen ("Metallurgy," p. 90), do not require the postulation of an allotropic molecule for their explanation.

Faraday Society, July 3.—Mr. W. R. Cooper in the chair.—Some notes on the rapid electro-deposition of copper: Sherard **Cowper-Coles.** The various processes for increasing the current densities in copper deposition by using mechanical means for keeping the copper smooth are classified as follows:—(1) revolving or moving the kathode; (2) burnishing the copper during electro-deposition; (3) insulating the growths on the copper so as to prevent further increase; (4) rapid circulation of the electrolyte; (5) revolving mandrel at a critical speed (centrifugal process).—The use of balanced electrodes: W. W. Haldane **Gee.**—The electrolytic oxidation of hydrocarbons of the benzene series, part ii., ethyl benzene, cumene and cymene: H. D. **Law** and Dr. F. Mollwo **Perkin.**—The electrolytic analysis of antimony: H. D. **Law** and Dr. F. Mollwo **Perkin.**—Notes on heat insulation, particularly with regard to materials used in furnace construction: R. S. **Hutton** and J. R. **Beard.**—Storage batteries and their electrolytes: R. W. **Vicarey.**—Alternate current electrolysis: Prof. E. **Wilson.**—The two last papers were taken as read, and the discussions postponed until the autumn.

DUBLIN.

Royal Irish Academy, June 26.—Prof. R. Atkinson, president, in the chair.—Prof. Ronald **Ross** gave an account of the researches which resolved the malaria problem, and took occasion to refer to the interesting mathematical problems connected with the diffusion of mosquitoes.

PARIS.

Academy of Sciences, July 31.—M. H. Poincaré in the chair.—The study of refraction at all heights. Formulæ relating to the determination of the coordinates of the stars: M. **Lœwy.** A development of a system of formulæ allowing of the deduction of the positions of two pairs of stars according to the new method given in the *Comptes rendus* for July 17. Three tables of solutions accompany the paper.—On an endoglobular hæmatozoa found in the jerboa: M. **Laveran.** The parasite is described and classified as *Haemogregarina Balfouri.*—On a secondary reaction of the halogen organo-magnesium compounds: Paul **Sabatier** and A. **Mailhe.** The cause of the low yield sometimes observed in the reaction between a ketone and an alkyl magnesium halogen compound is due to a secondary reaction resulting in the formation of a substituted ethylene. This tendency to the formation of an unsaturated hydrocarbon is especially marked in the case of the isobutyl derivatives. Details are given of several cases.—On the theory of surfaces and of envelopes of spheres in anallagmatic geometry: A. **Demoulin.**—On the properties of a holomorphic function in a circle where it does not take the values zero and unity: Pierre **Boutroux.**—On a new series of polynomials: A. **Buhl.**—On sliding friction: M. **de Sparre.** A solution of a problem enunciated by M. Appell in his treatise on mechanics.—The passage of electricity through gaseous layers of great thickness: E. **Bouty.** It has been shown in previous papers that the critical field $y=a\sqrt{p(p+b)}$, where p is the pressure (above 0·1 mm. of mercury), a the dielectric cohesion of the gas, and b a constant for the given flask and gas. In the present communication the constant b is found to be in inverse proportion with the thickness of the gaseous layer, e. The formula thus becomes

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[1] *Phil. Trans.*, A, 1904, pp. 385 *et seq.*; NATURE, vol. lxx. p. 213 (June 30, 1904).

[2] Felix Ehrenhaft, *Ann. der Phys.*, vol. xi. p. 489 (1903).

$$v=a\sqrt{p\left(p+\frac{k}{e}\right)},$$

where k is a constant which depends only on the nature of the gas.—The electrolytic detector with a metallic point: G. **Ferrié.** An experimental study of the use of the imperfect contact of a fine metallic point and an electrolyte as a detector for Hertzian oscillations.—On the phenomenon of Marjorana: A. **Cotton** and H. **Mouton.** A study of the behaviour of solutions of colloidal iron hydroxide in a strong magnetic field.—On a megaphone: G. **Laudet** and L. **Gaumont.** A gas flame, mechanically controlled, is used to intensify the sound waves.—On the state of matter in the neighbourhood of the critical point: Gabriel **Bertrand** and Jean **Lecarme.** Experiments made upon solutions of potassium bichromate in water and of alizarin in alcohol, at temperatures slightly above the critical points, have led to the conclusions that slightly above and below the critical temperature both the liquid and gaseous states exist simultaneously.—On the different states of oxidation of aluminium powder: M. **Kohn-Abrest.** Aluminium powder was heated by electrical means to various temperatures in a current of air; evidence was obtained of the formation of an oxide AlO.—The influence of the fragility of steel on the effects of mechanical treatment in a boiler works: Ch. **Frémont.**—The modification produced in the metal of rivets produced by the operation of riveting: M. **Charpy.**—On the constitution of sparteine: Charles **Moureu** and Amand **Valeur.** The authors summarise their recent work on this alkaloid, and propose a formula for it which is completely in accord with the facts known up to the present.—Chemical oxydases: G. **Baudran.**—On the variations of the basic function in chromium salts: Albert **Colson.**—On the presence of bile pigments in the medicinal leach: Camille **Spiess.**—Folded faults and horizontal overlapping in the Mesozoic of Portugal: P. **Choffat.**—On the geology of the southern Carpathians: G. M. **Murgoci.**—Observations on the mode of formation of deposits of blende enclosed in the stratified rocks: A. **Lodin.**

CALCUTTA.

Asiatic Society of Bengal, June 7.—Religion and customs of the Uraons or Oraons: Father **Dehon,** S.J., communicated by E. A. Gait. An account of the reputed origin, mythology, ceremonies, and folklore of an agricultural tribe now settled in Chota Nagpur, but thought to have come from farther south.—Note on a decomposition product of a peculiar variety of Bundelkhand Gneiss: C. **Silberrad.** A white clayey material found in the Ajaigarh State has been submitted by the author to Dr. O. T. Silberrad, the analysis of which is compared with that of pinite. The two substances were found to resemble one another.

July 5.—Four new barnacles from the neighbourhood of Java, with records of Indian pedunculate forms: Dr. N. **Annandale.** Of the new species, two belong to the genus Scalpellum, two to Alepas. Of the former, one is remarkable for its great size and for the reduction of the calcified valves; the other for its habit of forming a regular, branched, though not organically connected, colony of several generations. One Alepas is larger than any hitherto described. The specimens were presented to the Indian Museum by the Eastern Telegraph Company, and come, with one exception, from a depth of 160 fathoms. A list of the pedunculate cirripedes known from the seas of British India is added.—Additions to the collection of Oriental snakes in the Indian Museum, part ii.: Dr. N. **Annandale.** Notes on specimens lately received from the Andamans and Nicobars, with the description of a new sea-snake and a list of the Ophidia known to occur in these islands.—The Tibetan version of the Pramanasamuccaya, the first Indian work on logic proper, recovered from Tibet by the late Tibet Mission: Prof. Satis Chandra **Vidyābhūṣaṇa.**—Materials for a flora of the Malayan Peninsula, No. 17: Sir George **King,** F.R.S., and J. S. **Gamble,** F.R.S. This contribution commences with natural order Myrsineæ, and is continued by Sapotaceæ, Ebenaceæ, Styraceæ, and Oleaceæ. The draft of Ebenaceæ was prepared by Sir George King, that of the other orders by Mr. J. S. Gamble; but the new species are given under their joint names.

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